MCA Syllabus-I Year

Master of Computer Application (MCA)
# Regular Course (Scheme and Syllabus)

**MASTER OF COMPUTER APPLICATIONS (MCA)**

Faculty of Information Technology and Computer Science

Deenbandhu Chhotu Ram University of Science & Technology

Murthal (Sonipat) Haryana, India

From Session: 2011-12

**MCA – 1st Semester**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Paper Code</th>
<th>Title of Paper</th>
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<th>T</th>
<th>P</th>
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<td>Computer Fundamentals &amp; Programming in C</td>
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**Total**

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**MCA – 2nd Semester**

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**Total**

|       |       |       |       | 15 | 5  | 12 | 450 | 500 | 100 | 1050 | 27 |
MCA-101 COMPUTER FUNDAMENTALS AND PROGRAMMING IN C

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is require to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section – A

Computer Fundamentals: Computer components, characteristics & classification of computers, hardware & software, peripheral devices, system software, application software, compiler, interpreter, utility program, programming languages.
Algorithmic Development: Techniques of problem solving, Flowcharting, decision table, Structured programming concepts, Modular Programming, Algorithms for searching, sorting and merging, Programming methodologies: top-down and bottom-up programming.
Operating system: Definition and significance of OS, Introduction to DOS, UNIX, Linux, GUI windows and their important commands.

Section – B

Elements of C: C character set, identifiers and keywords, Data types: declaration and definition, storage classes in C, Type conversion, Types of error, ‘C’ macro, macro vs function.
Operators: Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators and their hierarchy & associativity.
Data input/output.

Section – C

Control statements: Sequencing, Selection: if and switch statement; alternation, Repetition: for, while, and do-while loop; break, continue, goto.
Functions: Definition, prototypes, passing parameters, recursion.
Data Structures: arrays, struct, union, string, data files.
Pointers: Declaration, operations on pointers, array of pointers, pointers to arrays.

References:

- E. Balaguruswami, Programming in ANSI C, Tata Mcgraw Hill.
- Gottfried, Programming with C, Tata Mcgraw Hill.
MCA-103  COMPUTER ORGANISATION

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is require to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section – A

Information Representation: Number systems, BCD codes, error detecting and correcting codes. Binary arithmetic operations, Booths multiplication.

Binary Logic: Boolean algebra, Boolean functions, truth tables, canonical and standard forms, simplification of Boolean functions, digital logic gates. Encoders, decoders, multiplexers, demultiplexers and comparators.

Section – B


Section - C

CPU organization: Processor organization, instruction cycles, instruction formats and addressing modes, microprogramming concepts, micro program sequencer. I/O Organization: I/O interface, interrupt structure, transfer of information between CPU/memory and I/O devices, and IOPs.

References:

- Mano, M. Morris Digital Logic and Computer Design, Pearson Educations
- Mano, M. Morris Computer system Architecture, Pearson Educations
MCA-105 DISCRETE MATHEMATICAL STRUCTURES

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is require to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section – A
Graphs: Introduction to graphs, Graph terminology, Representing Graphs and Graph Isomorphism, Connectivity. Directed and undirected graphs and their matrix representations, reachability, Chains, Circuits, Euler's paths and cycles, Hamiltonian paths and cycles, Minima's Path Application(Flow charts and state transition Graphs, Algorithm for determining cycle and minimal paths), Trees, Binary trees, Binary search trees and traversals, Graph coloring.

Section – B
Groups & Subgroups: Group axioms, permutation groups, subgroups, cosets, normal subgroups, semi - groups, free semi - groups, applications.
Finite Fields: Definition, representation, structure, minimal polynomials, polynomial roots, Splitting Field, Integral Domain, Irreducible polynomial.
Formal Languages: Representation of special languages and grammars, finite state machines.

Section – C
Lattices & Boolean Algebra: Relation to partial ordering, lattices, Hasse Diagram, Axiomatic definition of Boolean algebra as algebraic structures with two operations basic results truth values and truth tables, the algebra of propositional functions, Boolean algebra of truth values, Applications (Switching Circuit, Gate Circuit).

References:
MCA-107  SOFTWARE ENGINEERING

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is required to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section – A

Section – B
Structured Analysis: Initial Investigation, Feasibility study, Traditional and modern methods of requirement determination, SRS, Structuring the requirements: Process modeling, logic modeling, conceptual data modeling, Metrics. Validation VS verification

Section – C
Design Fundamentals: Function and Object Oriented Design concepts, Verification and Metrics.
Coding and Maintenance: Coding Process, Metrics, Testing fundamentals, Types of Testing, Metrics, Types of Maintenance.
Software Re-Engineering: Source Code Translation, Program Restructuring, Data Re-Engineering, Reverse Engineering.

References:
- Hoffer, George, Valacich, Modern System Analysis and Design 3rd Ed. Pearson Education
MCA-109  OPTIMIZATION TECHNIQUES AND STATISTICAL METHODS USING C

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1 (COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is required to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section – A
Linear Programming: Formulation, Graphical solution, standard and matrix forms of linear programming problems, Simplex method and its flow chart, Two phase Simplex method, Degeneracy.

Section – B
Duality: Introduction, Definition, General Rule for converting any primar into its Dual, Dual Simplex method and its flow chart.
Integer Programming: Importance and Applications, Gomorg's all integer programming problem technique, Branch and Bound Method.
PERT and CPM: Basic steps in PERT and CPM, Forward and Backward computation, Representation in Tabular form, Slack and Critical path, Difference between CPM and PERT, Float.

Section – C
Statistical methods: Sample distributions, Test of Significance, chi-square, t and F test.
Analysis of Variance: Definition, Assumptions, Cochran's Theorem, One-way classification, ANOVA Table, Two-way classification (with one observation per cell).

References:
• Kasana H.S, "Optimization techniques, Springer Verlag.
• J.C. Pant, Introduction to Optimization techniques: Operation Research, Jain brothers Publication, N. Delhi
MCA-102 INTRODUCTION TO INTERNET & WEB DESIGNING

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is require to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section-A

Internet Basics: Concept of Internet, evolution, Specification and establishment details. Modems: Types, functions, IP addressing, Internet domains, DNS, ISP, Intranets and extranets. Internet Connectivity: Telephone line, cable, leased line, ISDN, VSAT, RF link. Internet Applications: E-mail, Telnet, FTP, Video conferencing.

Section-B


Section-C


Front Page Web Tool: Front page editor, Front page explorer

References:

- Using the Internet, Honey Cutt, 4th ed., PHI.
- World Wide Web Designwith HTML , Xavier, TMH
- The complete reference – Front page , TMH
- Tech yourself the Internet in 24 Hrs, SAMS
MCA-104  DATA STRUCTURES USING C

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is require to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section – A
Introduction to Data Structures, Primitive and Composite, Arrays, Matrices, Sparse Matrices, String representation and manipulation.

Section B
Stacks: Concepts, Operations and representation in C, Application to evaluation of postfix expression, Conversion from infix to postfix representation.
Queue: Sequential representation, operations, priority queues and array implementation. Dequeue, Linked lists: concepts, operation, stack and queues as lists, array and dynamic representation, circular lists, doubly linked list, josephus problems
Trees, Binary trees, Threaded Binary tree, Balanced tree, Different tree traversal algorithms.

Section C
Representation of Graphs and Applications, various searching and sorting techniques, Hashing, Dynamic Memory Management.

References:
• Bandyopadhyay, Data Structure using C, Pearson Education
• Salaria R.S., Data Structure and algorithm using C, Khanna Publications
MCA-106                                      COMPUTER NETWORKS

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is require to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section - A
Network Concepts: Goals and applications of Computer Networks; Topologies; Categories of Networks - LAN, MAN, WAN, point-to-point and broadcast networks; Introduction to SMDS, X.25 Networks, ISDN, frame relay and ATM networks.
Network Architecture: Concept of protocols & services; OSI model and functions of its layers; TCP/IP reference model.
Data communication concepts: Components of a data communication system; transmission modes; transmission media - guided and wireless media; introduction to switching (circuit, message and packet) and multiplexing (frequency division and time division); concept of Modems.

Section - B
Framing and Error control: Framing techniques; Error control-error detection & correction.
Data Link Control: Acknowledgments; Sliding Window protocols.
Medium Access Control and LANs : Multiple Access protocols of MAC sub layer - ALOHA, 1-persistent, p-persistent and non-persistent CSMA, CSMA/CD, Collision free protocols, Limited contention protocols, Wavelength Division Multiple Access, MACA, GSM, CDPD, CDMA; IEEE Standard 802 for LANs and MANs-Ethernet, token bus, token ring, DQDB.

Section - C
Routing: Deterministic and Adaptive routing; Centralized and distributed routing; shortest-path; flooding; flow based; optimal; distance vector, link-state, hierarchical; routing for mobile hosts; broadcast and multicast routing;
Congestion control: Principles of congestion control; Traffic shaping; choke packets; load shedding; RSVP.
Transmission control protocol (TCP); user datagram protocol (UDP); Internet protocol (IP).

References:
• Computer Networks - Andrew s. Tanenbaum, Pearson Educations.
• Introduction to Data communications and Networking- Behrouz, Forouzan, Tata Mc-Graw Hill.
• Data and Computer Communications, William Stallings, Pearson education
• Data Communications, Computer Networks and Open Systems, fourth edition-Fred Halsall, Addison Wesley.
• Distributed Computing, Mahjan & Shah, Oxford Press New Delhi
MCA-108 SYSTEM SIMULATION

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is required to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section - A
INTRODUCTION: Concept of System, stochastic activities, continuous and discrete systems, system modeling, principals used in modeling.
Simulation of System: Concepts of simulation of continuous system with the help of examples; use of integration formulas; concepts of discrete system simulation with the help of examples. Generation of random numbers, Generation of non-uniformly distributed random numbers.

Section - B
Simulation of Queuing Systems: Basic concepts of queuing theory, Simulation of single - server, two-server and general queuing systems.
Simulation in inventory control and forecasting: Elements of inventory theory, inventory models, Generation of Poison and Erlang variates, forecasting and aggression analysis.

Section - C
Design and evaluation of simulation experiments: Experiment layout and Validation.
Simulation Languages: Continuous and discrete simulation languages, Black-Structured continuous simulation languages, Expression based languages, Discrete system simulation languages: GPSS, SIMSCRIPT, SIMULA, Factors in selection of discrete system simulation languages.

References:
- Narsingh Deo : "System Simulation with Digital Computer", PHI, New Delhi, 1993
MCA-110    OBJECT ORIENTED SYSTEM AND C++

Total Marks : 150
Maximum Pass Marks : 40%
Theory Paper : 100
Internal Assessment : 50
Time : 3 Hrs

Note: Total 8 Questions are to be set by the examiner covering the entire syllabus uniformly. Question No. 1(COMPULSORY) having Objective Type Questions of 2 marks from entire syllabus. Rest of the Seven questions are from Section A, B & C of Syllabus. A candidate is required to attempt any Four questions out of Sections A, B & C by selecting ATLEAST ONE Question from Each Section. All questions shall carry equal marks.

Section – A
Object-Oriented Concepts: Data abstraction, encapsulation, Classes and objects, modularity, hierarchy, typing, concurrency, persistence.
Object-Oriented Methodology: Advantages and disadvantages of OO methodologies. Modeling, Domain analysis. OMT Methodology-Object Model, links and associations, multiplicity, link attributes, role names, ordering qualification, aggregation, generalization and inheritance, abstract class, meta data, object diagram.

Section-B
Dynamic Model-events, states, scenarios, event traces, state diagram. Functional Model-data flow diagrams. Analysis, System design and Object design.
Data Types, structs vs. classes, static data & member function, constant parameters & member functions, friend functions & friend classes,

Section-C
Role of constructors & destructors, dynamic objects, operator overloading, function overloading, inheritance, virtual functions, abstract class, virtual class, template functions & template classes, exception handling, file stream classes, ASCII & Binary files, sequential & random access to a file.

References:
- R.S. Salaria Object Oriented Programming In C+, Khanna Publications
- Robertb Lafore, Object Oriented Programming with turbo C, Galgotia publication
- Booch, Grady, Object Oriented Analysis & Design, Addison Wesley, 1994
- Stroustrup, B., The C++ Programming Language, Addison-Wesley,1994
- Lippman, C++ Primer, 3/e, Addison-Wesley
Syllabus

Master of Computer Application
### SEMESTER-I

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*Practical Examination of MCA-106 & 107 may be conducted on the same day in 2 sittings each maximum of 4 hours.*

### SEMESTER-II

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*Practical Examination of MCA-206 & 207 may be conducted on the same day in 2 sittings each maximum of 4 hours.*
## MCA SECOND YEAR
### SEMESTER-III

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</thead>
<tbody>
<tr>
<td>MCA-301</td>
<td>Computer Graphics &amp; Multimedia</td>
<td>5</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>MCA-302</td>
<td>Operating Systems</td>
<td>5</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>MCA-303</td>
<td>Artificial Intelligence &amp; Expert Systems</td>
<td>5</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>MCA-304</td>
<td>Data Communication &amp; Computer Networks</td>
<td>5</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>MCA-305</td>
<td>Object Technology</td>
<td>4</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>MCA-306</td>
<td>SoftwareLab-5 i) Graphics Programming in C/C++ ii) Use of MatLab iii) PROLOG Programming</td>
<td>8</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>MCA-307</td>
<td>SoftwareLab-6 i) Java Programming</td>
<td>8</td>
<td>75</td>
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</tbody>
</table>

**Total** | **40** | **525** | **175** | **700** |

*Practical Examination of MCA-306 & 307 may be conducted on the same day in 2 sittings each maximum of 4 hours.*

### SEMESTER-IV

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Course</th>
<th>Course Requirements (Hrs)</th>
<th>University Exams</th>
<th>Internal Assessment</th>
<th>Total</th>
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<tbody>
<tr>
<td>MCA-401</td>
<td>Advanced Java Programming</td>
<td>5</td>
<td>75</td>
<td>25</td>
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<tr>
<td>MCA-402</td>
<td>Data Warehousing &amp; Mining</td>
<td>5</td>
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<td>MCA-403</td>
<td>Software Engineering</td>
<td>5</td>
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<tr>
<td>MCA-404</td>
<td>Advanced Database Systems</td>
<td>5</td>
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<tr>
<td>MCA-405</td>
<td>Visual Languages Programming</td>
<td>4</td>
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<tr>
<td>MCA-406</td>
<td>SoftwareLab-7 i) Advance Java Programming</td>
<td>8</td>
<td>75</td>
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<td>100</td>
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<tr>
<td>MCA-407</td>
<td>Software Lab-8 i) Visual Programming Using VB ii) ADS (Working with MS SQL Server)</td>
<td>8</td>
<td>75</td>
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<tr>
<td>MCA-408</td>
<td>Minor Project-I</td>
<td>2</td>
<td>-</td>
<td>25</td>
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</tbody>
</table>

**Total** | **42** | **525** | **200** | **725** |

*Practical Examination of MCA-406 & 407 may be conducted on the same day in 2 sittings each maximum of 4 hours.*
# MCA THIRD YEAR

## SEMESTER-V

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Course</th>
<th>Course Requirements (Hrs)</th>
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<tr>
<td>MCA-501</td>
<td>Advanced Technology</td>
<td>5</td>
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<td>MCA-502</td>
<td>Software Testing &amp; Quality Assurance</td>
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<tr>
<td>MCA-503</td>
<td>Windows Programming &amp; Visual C++</td>
<td>5</td>
<td>75</td>
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<td>100</td>
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<tr>
<td>MCA-504</td>
<td>Elective – I* Soft Computing</td>
<td>4</td>
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<td>100</td>
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<tr>
<td>MCA-505</td>
<td>Elective – II* Computer Security</td>
<td>5</td>
<td>75</td>
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<tr>
<td>MCA-506</td>
<td>Software Lab-9 i) .NET Programming Using C# and/or VB.NET</td>
<td>8</td>
<td>75</td>
<td>25</td>
<td>100</td>
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<tr>
<td>MCA-507</td>
<td>Software Lab-10 i) Windows Programming Using Visual C++</td>
<td>8</td>
<td>75</td>
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<tr>
<td>MCA-508</td>
<td>Minor Project-II</td>
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<td><strong>Total</strong></td>
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<td><strong>525</strong></td>
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*Practical Examination of MCA-506 & 507 may be conducted on the same day in 2 sittings each maximum of 4 hours.

## SEMESTER-VI

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Course</th>
<th>Course Requirements (Hrs)</th>
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<tr>
<td>MCA-601</td>
<td>Major Project</td>
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<td>375</td>
<td>125</td>
<td>500</td>
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<td><strong>Grand Total of 3 Years</strong></td>
<td></td>
<td></td>
<td><strong>3000</strong></td>
<td><strong>1100</strong></td>
<td><strong>4100</strong></td>
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</tbody>
</table>

## ELECTIVE – I*

At present only ‘Soft Computing’ course (MCA-504) is being offered under Elective-I but depending upon the availability of expertise and the required infrastructure determined by the University, any one of the following subjects could be offered in place of ‘Soft Computing’.

(i) Simulation and Modeling  
(ii) Theory of Computation  
(iii) Unix and Network Programming  
(iv) Enterprise Resource Planning  
(v) Object Oriented Analysis and Design  
(vi) Analysis & Design of Algorithms  
(vii) Multimedia and Its Applications  
(viii) Distributed Computing

## ELECTIVE – II*

At present only ‘Computer Security’ course (MCA-505) is being offered under Elective-II but depending upon the availability of expertise and the required infrastructure determined by the University, any one of the following subjects could be offered in place of ‘Computer Security’.

(i) Digital Image Processing  
(ii) Software Project Management  
(iii) Embedded Systems  
(iv) Bio-Informatics  
(v) Mobile Computing  
(vi) Neural Networks  
(vii) Perl Programming
MCA-301  COMPUTER GRAPHICS & MULTIMEDIA

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note : There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Unit-II

Unit-II
Two-dimensional Geometric Transformations : Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing.
Two-Dimension Viewing : The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping.
Three-Dimensional Concepts : Three Dimensional Display Methods, 3D Transformations, Parallel Proection and Perspective Projection.

Unit- IV
Case Study : A graphics software MatLab, Use of MatLab in graphics application, Features of MatLab, Generalize application by using MatLab.

Suggested Readings :
9. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time to time.
MCA-302 OPERATING SYSTEMS

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note : There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Process and CPU Scheduling : Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication Scheduling Criteria, Scheduling Algorithm, Multiple-Processor Scheduling, Real-Time Scheduling.

Unit-II

Unit-III

Unit-IV
Deadlocks : System Model, Dead locks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.
I/O Management - I/O software and its types, Disk Scheduling.
Shell Programming : Concept of shell, Types of shell, Editors for shell programming (e.g. vi), basics of Shell programming.
Case Study - UNIX, LINUX, and Windows NT.

Suggested Readings :
7. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time to time.
MCA-303 ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Introduction and applications of artificial intelligence, Problem solving: Defining the problem as state space search, Production system, Problem characteristics, Problem system characteristics, Search techniques: Generate and test, Hill climbing, Best first Search, A* algorithm, Problem reduction, Expert system: Definition, Role of knowledge in expert system, Architecture of expert system.

Unit-II

Unit-III

Unit-IV

Suggested Readings:
3. Carl Townsend: Introduction to Turbo Prolog, BPB.
4. Stamations V. Kartalopous: Understanding Neural Networks and Fuzzy Logic, PHI.
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
MDU MCA Syllabus - I Year

MCA-304 DATA COMMUNICATION & COMPUTER NETWORKS

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Data Communication: Theoretical basis of data communication; analog and digital signals; asynchronous and synchronous transmission; data encoding and modulation, techniques, broadband and base band transmission; pulse code modulation, bandwidth, channel, baud rate of transmission; multiplexing; transmission medium; transmission error detection and correction.

Unit-II
Network Classification and Data Communication Services:
Local area networks, metropolitan area network, wide area network, wireless network, internetworking; switched multi-megabit data services, X.25, frame relay, narrow band and board ISDN asynchronous transfer modes.

Unit-III
Datalink layer Functions and Protocols: Framing, error control, flow control; sliding window protocol; HDLC; Data link layer of Internet and ATM.

Unit-V
Network functions and protocols: Switching mechanism: Circuit switching, message switching, packet switching, cell switching, routing and congestion control, TCP/IP protocol architecture.

Suggested Readings:
2. W. Tomasi: Introduction to Data Communications and Networking, Pearson, Education.
7. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Arrays and Strings: Arrays, Arrays of Characters, String Handling Using String Class, Operations on String Handling Using, String Buffer Class.

Unit-II
Extending Classes and Inheritance: Using Existing Classes, Class Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Multiple Levels of inheritance, Abstraction through Abstract Classes, Using Final Modifier, The Universal Super-class Object Class.

Package & Interfaces: Understanding Packages, Defining a package, Packaging up Your Classes, Adding Classes from a package to Your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Packages, Concept of Interface.

Exception Handling: The concept of Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining Your Own Exceptions.

Unit-III
Multithreading Programming: The Java Thread Model, Understanding Threads, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Deadlocks Interthread communication, Deadlocks.

Input/Output in Java: I/O Basic, Byte and Character Structures, I/O Classes, Reading Console Input Writing Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.


Unit-IV
Working with Windows: AWT Classes, Window Fundamentals, Working with Frame, Creating a Frame Window in an Applet, Displaying Information Within a Window.


Suggested Readings:
1. The Complete Reference JAVA, TMH Publication.
2. Beginning JAVA, Ivor Horton, WROX Public.
3. JAVA 2 UNLEASHED, Tech Media Publications.
4. JAVA 2(1.3) API Documentations.
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
MCA-401  ADVANCED JAVA PROGRAMMING

Maximum Marks  : 75 Marks
Duration of Exam  : 3 Hours

Note : There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script.

Unit-II
Java Beans : Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean info Interface, Constrained properties Persistence, Customizers, Java Beans API.

Unit-III

Unit-IV
JSP Application Development : Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing– Displaying Values Using an Expression to Set an Attribute, Declaring variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages– Sharing Session and Application Data – Memory Usage Considerations.

Suggested Readings :
5. Murach : Murach's beginning JAVA JDK 5, SPD.
9. Building Web Applications - NIIT, PHI.
11. Jon Duckett : Beginning Web Programming, WROX.
13. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time to time.
MCA-402  DATA WAREHOUSING & MINING

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note : There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Need for data warehouse, definition, goals of data warehouse, Data Mart, Data warehouse, architecture, extract and load process, clean and transform data, star, snowflake and galaxy schemas for multidimensional databases, fact and dimension data, Designing fact tables, Partitioning, partitioning strategy—horizontal partitioning, vertical partitioning.

Unit-II
Data warehouse and OLAP technology, multidimensional data models and different OLAP operations, OLAP Server : ROLAP, MOLAP and HOLAP. Data warehouse implementation, efficient computation of data cubes, processing of OLAP queries, indexing OLAP data.

Unit-III
Data Preprocessing, data integration and transformation, data reduction, Discretization and concept Hierarchy Generation, Data mining primitives, Types of Data Mining, Data Mining query language, Architectures of data mining. Data generation & Summarization based characterization, Analytical characterization, Mining class comparisons, Mining descriptive statistical measures in large databases.
MIning Association Rules in large databases : Association rule mining, single dimensional Bookan association rules from Transactional DBS. Multi level association rules from transaction DBS, multidimensional association rules from relational DBS and DWS, Correlation analysis, Constraint based association mining.

Univ-IV
Classification and Prediction : Classification by decision tree induction, Back propagation, Bayesian classification, classification based in association rules, Prediction, classifier accuracy, Cluster analysis, partitioning and hierarchical methods, Denrity based methods, Grid based methods, web mining, Temporal and spatial data mining.

Suggested Readings :
1. W.H.Inmon : Building Data Ware House, John Wiley & Sons.
2. S. Anahory and D. Murray : Data Warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber : Data Mining - Concepts & Techniques, Harcourt India Pvt. Ltd. (Morgan Kaufmann Publishers).
4. Michall Corey, M. Abbey, I Azramson & Ben Taub : Oracle 8i Building Data Ware Housing, TMH.
5. I.H. Whiffen : Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
6. Sima Yazdanri & Shirky & S. Wong : Data Ware Housing with oracle.
8. IBM An Introduction to Building the Data Warehouse, PHI, Publication.
12. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time to time.
MDU MCA Syllabus - I Year

MCA-403 SOFTWARE ENGINEERING

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Software Project Management : Management activities, Project planning, Project scheduling, Risk management and activities.

Unit-II

Unit-III

Unit-IV

Suggested Readings:
1. Pressman : Software Engineering, TMH.
5. Ghezzi, Carlo : Fundaments of Software Engineering, PHI.

Note: Latest and additional good books may be suggested and added from time to time.
Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
The Extended Entity Relationship Model and Object Model: The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Object-Oriented Databases: Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control, Example of ODBMS.

Unit-II
Object Relational and Extended Relational Databases: Database design for an ORDBMS - Nested relations and collections; Storage and access methods, Query processing and Optimization; Advance Querying and Information Retrieval Decision Support Systems, Information Retrieval Systems Data Analysis and OLAP, Data Mining.

Unit-III
Parallel and Distributed Databases and Client-Server Architecture: Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins; Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed database; Concurrency control and Recovery in distributed databases.

Unit-IV
Databases on Web and Semi Structured Data: Web interfaces to the Web, Overview of XML; XML Applications; The semi structured data model, Implementation issues, Enhanced Data Models for Advanced Applications; Active database concepts. Temporal database concepts; Spatial databases, Concepts and architecture; Deductive databases and query processing; Mobile databases, Geographic information systems, Multimedia databases.

Suggested Readings:
4. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
MCA-405 VISUAL LANGUAGES PROGRAMMING

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Client Server Basics: Discover Client-Server and Other Computing Architectures, Understand File Server Versus Client -Server Database Deployment, Learn About the Two Tier Versus Three Tire Client- Server Model.
VB Advance Controls: Events, Menu bar, Popup Menus, Tool bar, Message box, Message Box, Input Box, Built-in Dialog Boxes, Creating MDI, Working with Menus.

Unit-II

Unit-III
Remote And ActiveX data Objects: Working with ODBC, Remote Data Objects And Remote data Control, Introducing ADO, ADO Data Control, Using DataGrid Control And ActiveX Data Objects.
ActiveX Controls, Extending ActiveX Controls And Classes: Creating, Testing, Compiling, Enhancing and User Drawn ActiveX Controls, Using ActiveX Control Interface Wizard And Property Pages Wizard, Introducing Ambient, Extender Objects, Creating Property Pages, Building Class Modules, ActiveX DLL.

Unit-IV
Client-Server Development Tools: COM, Services Models, Development Tools Included with VB 6, Working With Source Safe Projects Reports And Packaging: Data Reports And Crystal Reports, Packaging A Standard EXE Project.
VB And Internal: Introduction to VBScript, Tools used with VBScript and VBScript Languages, Introduction to Active Server Pages, ASP Objets.

Suggested Readings:
2. Holzner Steven: Visual Basic Programming, IDG Books India Ltd.
4. Visual Basic 6 Client/Server How-To
6. Any other book(s) covering the content of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
Minor Project - I (MCA-408) & II (MCA-508)  
(Guideline for Minor Project)

- The aim of the Minor Project(s) is to lay a foundation for Major Project to be carried out by the student during 6th Semester of MCA Programme.
- Each student should carry out Minor Project(s) using the software development tools/languages/technologies that they have learnt and/or have studied during the concerned semester.
- It should be compulsorily done by the student in-house under the supervision of the staff(s) assigned by Head of the Department/Director/Principal.
- The Minor Project(s) will be assessed by the concerned supervisor(s) and shall award marks out of 25 for each students as Internal Assessment.
MDU MCA Syllabus - I Year

MCA-501   ADVANCED TECHNOLOGY

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note : There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Basic of the .net framework : .net architecture, managed code, assemblies, CLR, Execution of assemblies code, IL, JIT, .NET framework class library, common type system, common language specification, interoperability with unmanaged code.

Unit-II
Introduction to V.B. Net and C# : VB.Net : Net features, DAta Types C# : Data Types, Operators, Garbage Collection, Jagged Array, Collection (Array list, Hash table), Indexer (one Dimension) and property, Delegates and events (Multicasting, Multicasting Event). Exception Handling.

Unit-III
ADO.Net & Object Oriented Concepts (Using VB.net or C#) Basic window control, Architecture of ADO.Net, Comparison with ADO, .Net Data provider, Data Adapter, Data Set, Data Row, Data Column, Data Relation, command, Data Reader, Data Grid Constructor, Destructor, Abstraction, Interface, polymorphism (Over loading and over ridding).

Unit-IV
ASP. Net : Anatomy of ASP .NET Page, Server Controls : label, dropdown list box, validation controls, list box, text box, radio button, check box, State Management : session caching, Authentication (window,.Net Passport, Forms Based), Authorization, web services, Advance Grid Manipulation.

Suggested Readings :
5. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time to time.
MCA-502 SOFTWARE TESTING & QUALITY ASSURANCE

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

**Note**: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

**Unit-I**
Software Testing and the related concepts: significance and potential; Testability and features of Test cases.
Software Testing techniques; WBT, BBT, Ticking Box testing; static analysis, symbolic testing, program mutation testing, input space, partitioning, functional program testing, data flow guided testing.

**Unit-II**
Software Testing Strategies: Approach, Issues, integration, incremental, System, alpha, Beta testing etc;
Comparative evaluation of techniques: Testing tools; Dynamic analysis tools, test data generators, Debuggers test drivers etc. Technical Metrics for Software: Quality Factors, framework; Metrics for analysis, design, testing source code etc.

**Unit-III**
Object Oriented Testing: OOT strategies and issues, Test Case design, interface testing.
Software Quality Assurance: concept, importance and essence; FTR, structured walk through technique etc.

**Unit-IV**
SW Reliability, validation, Software Safety and Hazards Analysis; Features affecting software quality, SQA Plan. Using project management software tools, Quality management, issue, standard and methods. ISO Quality models: ISO 9000 and SEICMM and their relevance.

**Suggested Readings:**
3. Pressman: Software Engineering, TMH.
5. Ghazz, Carlo: Fundaments of Software Engineering, PHI.
9. Any other book(s) covering the contents of the paper in more depth.

**Note**: Latest and additional good books may be suggested and added from time to time.
MCA-503    WINDOWS PROGRAMMING & VISUAL C++

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Unit-II
Working with Graphics, Consoles, Multitasking Process and Threads Clipboard Drag and Drops, Advance features of Windows Programming GDI Metafiles, Sound API, DLL.

Unit-III

Unit-IV
Visual C++ And Database Management : MFC programming without View Document Architecture, Data Access Objects (DAO) versus Open Database Connectivity (ODBC), Database building Overview, Building a Database Application using ODBC, Building a Database Application Using.

Suggested Readings:
2. Herbett Schildts : Windows Programming, TMH.
3. Murray : VC++, TMH.
4. Steve Holzner : Introduction to VC++.
5. Any other book(s) covering the contents of the paper in the depth.

Note: Latest and additional good books may be suggested and added from time to time.
Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Unit-II
Artificial neural networks and applications: Different artificial neural network models; learning in artificial neural networks; neural network applications in control systems. Neural Nets and applications of Neural Network.

Unit-III
Fuzzy systems and applications: Fuzzy sets, fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering; applications of fuzzy systems. Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control.

Unit-IV

Suggested Readings:
15. Mitchell, Melanie: An Introduction to Genetic Algorithms, PHI.
16. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
MDU MCA Syllabus - I Year

MCA-505      COMPUTER SECURITY

Maximum Marks : 75 Marks
Duration of Exam : 3 Hours

Note : There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Unit-II

Unit-III

Unit-IV

Suggested Readings :
3. Charlie Kaufman, Radia Perlman, Mike Speciner : Network Security, Private communication in a public world, PHI.
5. Bruce Schneier, Niels Ferguson : Practical Cryptography, Wiley Dreamtech India Pvt. Ltd.
6. Any other book(s) Covering the contents of the paper in more depth.

Note : Latest and additional good books may be suggested and added from time to time.
Minor Project – I (MCA-408) & II (MCA-508)  
(Guideline for Minor Project)

- The aim of the Minor Project(s) is to lay a foundation for Major Project to be carried out by the student during 6th Semester of MCA Programme.
- Each student should carry out Minor Project(s) using the software development tools/languages/technologies that they have learnt and/or have studied during the concerned semester.
- It should be compulsorily done by the student in-house under the supervision of the staff(s) assigned by Head of the Department/Director/Principal.
- The Minor Project(s) will be assessed by the concerned supervisor(s) and shall award marks out of 25 for each student as Internal Assessment.